REMARKS

In response to the Office Action mailed May 21, 2008, Applicant respectfully requests reconsideration. Claims 1-28 were previously pending in this application. By this amendment, claims 1, 7, 8, 14, 15, 21, 22 and 28 have been amended. Claims 6, 13, 20 and 27 have been canceled without prejudice or disclaimer. As a result, claims 1-5, 7-12, 14-19, 21-26 and 28 are pending for examination with claims 1, 8, 15 and 22 being independent. No new matter has been added.

As a preliminary matter, Applicant notes that the independent claims have been amended as suggested on page 2 of the Office Action in order to advance prosecution as suggested in the Office Action. Applicant notes that no objections or rejections have been made on page 2 of the Office Action and the amendments are not made in response to any objection or rejection.

In addition, dependent claims 7 and 21 have been amended for consistency purposes. Claims 6 and 20 have been canceled and their subject matter has been incorporated into independent claims 1 and 15.

Dependent claims 21 and 28 have also been amended for consistency purposes. Claims 13 and 27 have been canceled and their subject matter has been incorporated into independent claims 8 and 22, respectively.

Rejections Under 35 U.S.C. §103. I

The Office Action rejected claims 1, 6, 7, 15, 20, and 21 (including independent claims 1 and 15) under 35 U.S.C. 103(a) as allegedly being unpatentable over Applicant's Admitted Prior Art ("Admitted Art") in view of Craft et al., US Patent No. 6,687,758 ("Craft"). Applicant respectfully disagrees.

A. Independent Claim 1

Claim 1, as amended, recites:

> A method for transferring control between a first network interface controller and at least a second network interface controller in a multiple network interface device, the method comprising:

after the first network interface controller sends *an identifier associated with a memory location in the multiple network interface device* to a second device and the identifier and an associated data field are received by the second network interface controller in the multiple network interface device from the second device, receiving a message from the second network interface controller in the multiple network interface device by a program component of the multiple network interface device, the message indicating the reception of the identifier associated with the memory location in the multiple network interface device and the associated data field from the second device, wherein the second network interface controller has no knowledge of the identifier and the associated data field, and *wherein the first network interface controller and the second network interface controller operate under a remote direct memory access (RDMA) protocol*;

passing the identifier to the program component;

querying the first network interface controller to supply the program component with a list of identifiers generated by the first network interface controller and associated memory locations in multiple network interface device memory;

identifying, by the program component, that the first network interface controller generated the identifier; and

transmitting the memory location associated with the identifier to the second network interface controller, wherein the second network interface controller transmits the associated data field to the memory location.

(Emphasis added).

On page 5, the Office Action concedes that the Admitted Art "does not show the particular steps recited in the claim for handling identifiers generated by one NIC and received by another NIC in the same machine, in cases when control is transferred [paths changed] between a first network interface and at least a second network interface in a multiple network interface device." The Office Action then states, on page 6, that Craft teaches limitations of claim 1.

Applicant respectfully notes that claim 1 has been amended to incorporate the subject matter of claim 6 and to thus recite that the first network interface controller and the second network interface controller operate under *a remote direct memory access (RDMA) protocol* (emphasis added). The Office Action rejected claim 6 alleging that the Admitted Art in view of Craft "shows that the first network interface and the second network interface operate under a remote direct memory access (RDMA) protocol (par. [0003]-[0005] in Applicant's admitted

prior art; col. 4, lines 40-42 in Craft)." Applicant respectfully notes that Craft discusses that upon matching the packet summary with the Communication Control Block (CCB), assuming no exception conditions exist, the data of the packet, without network or transport layer headers, is sent by *direct memory access (DMA)* units to the destination in storage 23 denoted by the CCB, which may, for example, be a file cache for an application (col. 4, lines 37-43) (emphasis added). This is the only portion of Craft where direct memory access is mentioned. Claim 1 recites that the first network interface controller and the second network interface controller operate under a *remote* direct memory access (RDMA) protocol rather than the direct memory access (DMA).

Furthermore, the Office Action states that Craft teaches "receiving a message from the second network interface controller in the multiple network interface device [INIC 22 sends the packet that it cannot process according to the fast-path connection to the INIC device driver] (col. 6 lines 43-47) by a program component of the multiple network interface device [at least one or more of the INIC device driver (64), the ATCP stack (62), and the port aggregation driver (66)] (Fig. 1), the message indicating the reception of the identifier and the associated data field [INIC 22 sends the packet that it cannot process according to the fast-path connection to the INIC device driver, which alerts the port aggregation driver (66) of fast-path connection migration] (col. 5 lines 30-34)."

Craft is directed to at least one intelligent network interface card (INIC) that is coupled to a host computer to offload protocol processing for multiple network connections, reducing the protocol processing of the host (Abstract). A host computer 20 of Craft has a CPU 24, a memory 21, storage 23, a first INIC 22 and a second INIC 25 (col. 2, lines 19-21; Fig. 1). Craft discusses that INIC 22 chooses whether to send a packet received from a network channel 32-35 to the host memory 21 for slow-path processing of the headers by the CPU 24 running protocol stack 60 or 62, or to send the packet data directly to a destination in storage 23 (col. 3, lines 43-47). The fast-path may be selected for the vast majority of data traffic having plural packets per message that are sequential and error-free (Craft, col. 3, lines 47-49). The fast-path avoids the time consuming protocol processing of each packet by the CPU 24, such as repeated copying of the data and repeated trips across the host memory bus 59 (Craft, col. 3, lines 49-52). The host memory 21 includes an ATCP protocol processing stack 62 that is used to offload selected

network connections to the INICs 22 and 25 for fast-path processing of messages corresponding to those selected connections (Craft, col. 3, lines 12-19).

In the cited passage, Craft discusses that the INIC 22 that receives the packet cannot process the packet according to the fast-path connection, and instead sends the packet to the INIC device driver 64, which is configured to divert fast-path type message packets to the ATCP stack 62 for processing (col. 6, lines 42-46). This may happen when, after the fast-path processing has begun, port aggregation switch 37 changes the port selection for load balancing purposes (Craft, col. 6, lines 36-39). Thus, Craft describes sending *the packet* that the INIC 22 cannot process to the INIC device driver. By contrast, claim 1 recites sending *the message indicating the reception of the identifier associated with the memory location* in the multiple network interface device and the associated data field (emphasis added). While it is not entirely clear from the Office Action whether it refers to the packet as the message indicating the reception of the identifier or as the identifier itself, it appears that nowhere in the reference does Craft teach or suggest this limitation.

Further, claim 1 has been amended to recite, *inter alia*, that after *the first network interface controller sends an identifier associated with a memory location in the multiple network interface device* to a second device and *the identifier and an associated data field are received by the second network interface controller* in the multiple network interface device from the second device, receiving a message from the second network interface controller in the multiple network interface device ... (emphasis added). Again, Craft's packet that the INIC 22 cannot process is different from an identifier associated with a memory location in the multiple network interface device. Craft discusses that a packet received at port 52 is first processed by mechanism 26 to generate the packet summary, a hash of the packet summary is then compared with the hash table, and if necessary with the CCBs cached in memory 70, to *determine whether the packet belongs to a message for which a fast-path connection has been set up* (col. 4, lines 32-37) (emphasis added). Upon *matching the packet summary with the CCB*, assuming no exception conditions exist, the data of the packet, without network or transport layer headers, is sent by direct memory access (DMA) units to the *destination in storage 23 denoted by the CCB*, which may, for example, be a file cache for an application (Craft, col. 4, lines 37-42) (emphasis

added). Thus, Craft describes that the generated packet summary is compared with the CCB and, if there is a match, the data of the packet is sent to the destination in storage 23 denoted by the CCB. The packet described in Craft is different from an identifier associated with a memory location in the multiple network interface device. Thus, Craft does not teach or suggest that the first network interface controller sends an identifier associated with a memory location in the multiple network interface device to a second device and the identifier and an associated data field are received by the second network interface controller.

Craft describes that when a message, such as a file write, that corresponds to the CCB is received by the INIC 22, a header portion of an initial packet of the message is sent to the host 20 to be processed by the CPU 30 and protocol stack 38 (col. 4, lines 10-13). This header portion sent to the host contains a session layer header for the message (Craft, col. 4, lines 13-15). The processing of the session layer header by ATCP stack 62 identifies the data as belonging to the file and indicates the size of the message, which are used by a host 20 file system *to reserve a destination for the data in storage 23* (Craft, col. 4, lines 17-21). A list of buffer addresses for the destination in storage 23 is sent to the INIC 22 and *stored in or along with the CCB* (Craft, col. 4, lines 23-24) (emphasis added). Thus, Craft discusses that host 20 *reserves a destination* for the data in storage 23 **when** *a file write is received* by the INIC 22 (emphasis added). Therefore, again, Craft does not teach that the identifier and an associated data field are received by the second network interface controller in the multiple network interface device from the second device.

Further, the Office Action states that Craft teaches "transmitting a memory location associated with the identifier to the second network interface [commanding the INIC 25 to flush the fast-path CCB back to the ATCP stack for processing the packet, and subsequently handing out the CCB to the INIC 22, which is now associated with the connection] (col. 6 lines 54-57), wherein the second network interface is capable of transmitting the associated data field to the memory location associated with the identifier when programmed with the CCB in the same way as the first network interface was capable of performing the recited function prior to migration of the fast-path connection (col. 4 lines 30-44)." Claim 1 has been amended, as suggested on page 8 of the Office Action, to recite "transmitting the memory location associated with the identifier

to the second network interface controller, wherein the second network interface controller transmits the associated data field to the memory location."

In the cited passage, Craft discusses that the ATCP stack 62 maintains a list of the CCBs that have been offloaded to INICs 22 and 25 and recognizes that the slow-path packet corresponds to a CCB that is in a fast-path state (col. 6, lines 47-50). Upon receiving this exception condition, the ATCP stack 62 will command the INIC 25 to flush the fast-path CCB back to the ATCP stack 62 (Craft, col. 6, lines 50-53). *After the packet has been processed by the ATCP stack 62* and the state of the CCB updated to reflect that processing, *the CCB can then be handed out to the INIC 22*, which is known by port aggregation driver 66 to be associated with the connection (Craft, col. 6, lines 53-57) (emphasis added). Thus, in Craft, the ATCP stack 52 processes the packet. Further, Craft states that **after** the packet had been processed, the CCB can be handed out to the INIC 22. By contrast, claim 1 recites that *the second network interface controller transmits* the associated data field to the memory location (emphasis added). Thus, Craft does not teach or suggest that the second network interface controller transmits the associated data field to the memory location, as recited in claim 1.

In view of the foregoing, claim 1 patentably distinguishes over the Admitted Art and Craft, either alone or in combination.

Claims 2-5 and 7 depend from claim 1 and are allowable for at least the same reasons.

Accordingly, withdrawal of the rejection of claims 1-5 and 7 is respectfully requested.

B. Independent Claim 15

Claim 15, as amended, recites:

> A computer readable medium having stored therein instructions for performing acts for transferring control between a first network interface controller and at least a second network interface controller in a multiple network interface device, the acts comprising:
>
> after the first network interface controller sends *an identifier associated with a memory location in the multiple network interface device* to a second device and the identifier and an associated data field are received by the second network interface controller in the multiple network interface device, receiving a message from the second network interface controller by a program component in the multiple network interface device, the message indicating the reception of the

identifier associated with the memory location in the multiple network interface device and the associated data field from the second device, wherein the second network interface controller has no knowledge of the identifier and the associated data field, and *wherein the first network interface controller and the second network interface controller operate under a remote direct memory access (RDMA) protocol*;

passing the identifier to the program component;

querying the first network interface controller to supply the program component with a list of identifiers generated by the first network interface controller and associated memory locations in multiple network interface device memory;

identifying, by the program component, that the first network interface controller generated the identifier; and

transmitting the memory location associated with the identifier to the second network interface controller, wherein the second network interface controller transmits the associated data field to the memory location.
(Emphasis added).

On page 9, the Office Action states that the Admitted Art in view of Craft "shows a computer readable medium having stored therein instructions for performing acts of method 1." Claim 15 has been amended similarly to claim 1. As should be clear from the above discussion in connection with claim 1, neither the Admitted Art nor Craft teaches or suggests all the limitations of claim 15. In particular, neither the Admitted Art nor Craft teaches or suggests "an identifier associated with a memory location in the multiple network interface device," as recited in claim 15. Further, neither the Admitted Art nor Craft teaches or suggests "transmitting the memory location associated with the identifier to the second network interface controller, wherein the second network interface controller transmits the associated data field to the memory location," as also recited in claim 15.

In view of the foregoing, claim 15 patentably distinguishes over the Admitted Art and Craft, either alone or in combination.

Claims 16-19 and 21 depend from claim 15 and are allowable for at least the same reasons.

Accordingly, withdrawal of the rejection of claims 15-19 and 21 is respectfully requested.

Rejections Under 35 U.S.C. §103. II

The Office Action rejected claims 8-14 and 22-28 (including independent claims 8 and 22) under 35 U.S.C. 103(a) as allegedly being unpatentable over the Admitted Art in view of Craft, in view of Starr et al., US Patent No. 6,807,581 ("Starr"), and in further view of Recio et al., An RDMA Protocol Specification (Version 1.0) ("Recio"). Applicant respectfully disagrees.

C. Independent Claim 8

Claim 8, as amended, recites:

> A method for transferring control between a first network interface controller and at least a second network interface controller in a host computer including the first network interface controller and the second network interface controller, the method comprising:
>
> receiving an identifier from a remote computer by the at least a second network interface controller, *the identifier generated by the first network interface controller and associated with a memory location in the host computer*, wherein the second network interface controller has no knowledge of the identifier and the associated data field, and *wherein the first network interface controller and the second network interface controller operate under a remote direct memory access (RDMA) protocol*;
>
> *sending a message to a program component indicating the reception of the identifier*, the program component queries the first network interface controller for a list of identifiers generated by the first network interface controller and associated memory locations in the host computer;
>
> passing the identifier received from the remote computer to the program component;
>
> searching the list of identifiers for the identifier;
>
> *when the list of identifiers includes the identifier received from the remote computer, receiving a memory location associated with the identifier*; and
>
> *when the list of identifiers does not include the identifier received from the remote computer, invalidating the identifier received from the remote computer.*
> (Emphasis added).

On page 13, the Office Action concedes that the Admitted Art does not teach "sending a message to a program component indicating the reception of the identifier, the program component configured to query the first network interface controller for a list of identifiers generated by the first network interface controller and associated memory locations in the host computer; passing the identifier received from the remote computer to the program component;

searching the list of identifiers for the identifier; if the list of identifiers includes the identifier received from the remote computer, receiving a memory location associated with the identifier; and if the list of identifiers does not include the identifier received from the remote computer, invalidating the identifier received from the remote computer."

The Office Action then alleges that Craft teaches "sending a message to a program component indicating the reception of the identifier [INIC 22 sends the packet that it cannot process according to the fast-path connection to the INIC device driver, wherein a program component is interpreted to include at least one or more of the INIC deice driver (64),the ATCP stack (62), and the port aggregation driver (66)] (col. 6 lines 43-47; Fig. 1), the program component configured to query the first network interface controller for a list of identifiers [commanding the INIC 25 to flush the fast-path CCB back to the ATCP stack, wherein CCB contains a list of identifiers] (col. 3 lines 59 to col. 4 line 9; col. 6 lines 47-53); and passing the identifier received from the remote computer to the program component [passing the packet that includes identifier in the packet summary to the INIC driver] (col. 4 lines 30-43; col. 6 lines 43-47)." Applicant respectfully disagrees.

As should be clear from the above discussion, Craft does not teach or suggest "the identifier generated by the first network interface controller and associated with a memory location in the host computer," as recited in claim 8. Further, Craft does not teach or suggest "sending a message to a program component indicating the reception of the identifier," as also recited in claim 8.

On page 15, the Office Action concedes that the Admitted Art does not show "searching the list of identifiers for the identifier; if the list of identifiers includes the identifier received from the remote computer, receiving a memory location associated with the identifier; and if the list of identifiers does not include the identifier received from the remote computer, invalidating the identifier received from the remote computer." The Office Action alleges that Starr "shows: searching the list of identifiers [comparing packet summary with CCB hashes and CCB cache] (Fig. 3 step (110); col. 9 lines 40-44); if the list of identifiers includes the identifier received from the remote computer, receiving a memory location associated with the identifier [if the packet summary matches a CCB, receiving a memory location according to a file system] (Fig. 3

steps (120) and (122); col. 9 lines 55-61); and if the list of identifiers does not include the identifier received from the remote computer [if the packet summary does not match a CCB] (Fig. 3 step (110); col. 9 lines 44-46, [sending packet to stack for slow-path processing] (Fig. 3 step (112); col. 9 lines 44-46)."

It is not clear which identifiers in the packet summaries of Starr the Office Action refers to when stating that Starr teaches the identifier recited in claim 8. Starr describes that when a network packet that is directed to the host 20 arrives at the INIC 22, *the headers for that packet are processed* by the sequencers 52 to validate the packet and *create a summary or descriptor of the packet*, with the summary prepended to the packet and stored in frame buffers 77 and a pointer to the packet stored in a queue (col. 6, lines 58-63). *The summary* is a status word (or words) that *describes the protocol types of the packet headers* and *the results of checksumming* (Starr, col. 6, lines 63-66). Nowhere does Starr even mention that the packet summary includes the identifier associated with a memory location in the host computer. Thus, Starr does not teach or suggest the identifier generated by the first network interface controller and associated with a memory location in the host computer recited in claim 1.

Further, on page 16, the Office Action states that "Applicant's admitted prior art in view of Craft and in further view of Starr does not show invalidating the identifier received from the remote computer if the list of identifiers does not include the identifier received from the remote computer." The Office Action alleges that Recio "shows invalidating the identifier received from the remote computer (page 5 lines 15-24; page 12 lines 46-50; page 21)."

The Office Action states that "[i]t would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Applicant's admitted prior art in view of Craft and in further view of Starr *by invalidating the identifier received from the remote computer* if the list of identifiers does not include the identifier received from the remote computer, and, therefore, the packet is sent to stack for slow-path processing (Fig. 3 step (112) in Starr) in order to prevent a remote host from subsequent access to the memory location associated with the identifier once the packet is processed, which is the feature provided by the RDMA protocol specification, wherein all of Applicant's admitted prior art, Craft, and Starr are using DMA for data transfer" (emphasis added). Applicant respectfully disagrees. The Office

Action refers to packet summaries of Craft as including an identifier associated with a memory location recited in claim 8 (*See* page 14). Similarly, the Office Action refers to packet summaries of Starr as including the identifier recited in claim 8 (*See* page 15).

Starr describes that a packet sent from a network such as LAN/WAN 25 is first received 100 at the INIC 22 (col. 9, lines 22-24; Fig. 3). The network, transport and, optionally, session layer *headers* of that packet are then processed 102 by the sequencers 52, which validate the packet and *create a summary of those headers* (Starr, col. 9, lines 26-29). Thus, as also discussed above, the packet summary of Starr describes the packet headers.

Further, Starr describes that for the case in which the packet is a fast-path candidate, the packet summary is then compared 110 with a set of fast-path connections being handled by the card, each connection represented as a CCB, by matching the summary with CCB hashes and the CCB cache (col. 9, lines 40-44). If the summary *does not match a CCB* held in the INIC memory, the packet is sent 112 to host memory *for processing the headers of the packet* by the CPU running instructions from the protocol stack (Starr, col. 9, lines 44-47). Thus, when the packet summary of Starr does not match a CCB, the headers of the packet are sent to be processes by the CPU. At the same time, the packet summary is a status word that describes the packet headers. Therefore, it is not clear why one of skill in the art would invalidate the packet summary describing the packet headers when the packet summary does not match a CCB when, in such scenario, the headers are processed by the CPU. Moreover, as discussed above, it is not clear from the Office Action what identifier in the packet summary of Starr the Office Action refers to because Starr states that the summary is a status word (or words) that describes the protocol types of the packet headers and the results of checksumming (col. 6, lines 63-66). Thus, one of skill in the art would not be motivated to combine the Admitted Art, Craft, Starr and Recio to invalidate the identifier received from the remote computer when the list of identifiers does not include the identifier received from the remote computer.

In view of the foregoing, claim 8 patentably distinguishes over the Admitted Art, Craft, Starr and Recio, either alone or in combination.

Claims 9-12 and 14 depend from claim 8 and are allowable for at least the same reasons.

Accordingly, withdrawal of the rejection of claims 8-12 and 14 is respectfully requested.

D. Independent Claim 22

Claim 22, as amended, recites:

> A computer readable medium having stored therein instructions for performing acts for transferring control between a first network interface controller and at least a second network interface controller in a host computer including the first network interface controller and the second network interface controller, the method comprising:
>
> receiving an identifier from a remote computer by the at least a second network interface controller, *the identifier generated by the first network interface controller and associated with a memory location in the host computer*, wherein the second network interface controller has no knowledge of the identifier and the associated data field, and *wherein the first network interface controller and the second network interface controller operate under a remote direct memory access (RDMA) protocol*;
>
> *sending a message to a program component indicating the reception of the identifier*, the program component queries the first network interface controller for a list of identifiers generated by the first network interface controller and associated memory locations in the host computer;
>
> passing the identifier received from the remote computer to the program component;
>
> searching the list of identifiers for the identifier;
>
> *when the list of identifiers includes the identifier received from the remote computer, receiving a memory location associated with the identifier*; and
>
> *when the list of identifiers does not include the identifier received from the remote computer, invalidating the identifier received from the remote computer.*
> (Emphasis added).

On page 19, the Office Action rejects claim 22 for the same reasons as claim 8. As should be clear from the above discussion in connection with claims 1 and 8, neither of the cited references teaches or suggests "receiving an identifier from a remote computer by the at least a second network interface controller, the identifier generated by the first network interface controller and associated with a memory location in the host computer, wherein the second network interface controller has no knowledge of the identifier and the associated data field, and wherein the first network interface controller and the second network interface controller operate under a remote direct memory access (RDMA) protocol; sending a message to a program component indicating the reception of the identifier, the program component queries the first

network interface controller for a list of identifiers generated by the first network interface controller and associated memory locations in the host computer; passing the identifier received from the remote computer to the program component; searching the list of identifiers for the identifier; when the list of identifiers includes the identifier received from the remote computer, receiving a memory location associated with the identifier; and when the list of identifiers does not include the identifier received from the remote computer, invalidating the identifier received from the remote compute," as recited in claim 22.

In view of the foregoing, claim 22 patentably distinguishes over the Admitted Art, Craft, Starr and Recio, either alone or in combination.

Claims 23-26 and 28 depend from claim 22 and are allowable for at least the same reasons.

Accordingly, withdrawal of the rejection of claims 22-26 and 28 is respectfully requested.

CONCLUSION

A Notice of Allowance is respectfully requested. The Examiner is requested to call the undersigned at the telephone number listed below if this communication does not place the case in condition for allowance.

If this response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicant hereby requests any necessary extension of time. If there is a fee occasioned by this response, including an extension fee, the Director is hereby authorized to charge any deficiency or credit any overpayment in the fees filed, asserted to be filed or which should have been filed herewith to our Deposit Account No. 23/2825, under Docket No. M1103.70194US00.

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Respectfully submitted,

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